State of Vermont

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation
State Geologist
Natural Resources Conservation Council

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STATE OF VERMONT, FOREST INSECT & DISEASE CONDITIONS, HIGHLIGHTS

Gypsy Moth populations increased dramatically this year, causing 21,480 acres of moderate to heavy defoliation compared to 1300 acres of light to moderate defoliation in 1988. A suppression project is planned for about 8500 acres in the spring of 1990, primarily in the greater Burlington area.

Pear Thrips damage to sugar maple was less severe and less extensive than in 1988 with only 3174 acres mapped from the air compared to 469,000 acres in 1988. Thrips population levels dropped in the southern part of the state and increased dramatically in the northern part of the state. Less severe damage than anticipated in central and northern Vermont was attributed to two factors: first, budbreak was very fast, allowing thrips little opportunity to feed in the buds and cause heavy injury; second, thrips emergence may have been delayed due to lack of snow cover and frozen soil conditions.

Anthracnose damaged 95,430 acres of sugar maple and associated hardwoods throughout the state, as detected by aerial survey.

Maple Chlorosis was aerially detected on an additional 103,388 acres in north-central and northeastern Vermont. Leaves of hardwood trees, particularly sugar maple, turned very chlorotic by mid-summer and some of these leaves dropped prematurely. This condition may be related to the 1988 drought, but there were numerous contributing factors including an abundance of foliage diseases (i.e. anthracnose, tar spot, leaf spots), leaf scorch, heavy seed crops and small leaves on red maple, top dieback and small leaves on yellow birch, and defoliation by birch leaf miner and birch skeletonizer on birch and pear thrips and maple leaf cutter on sugar maple.

Drought conditions in 1988 combined with winter injury from the lack of snow cover are thought to be the cause of widespread losses of conifers. Recently planted spruces and relatively young balsam fir ornamentals were particularly affected, especially when on dry or exposed sites. Other species affected to a lesser degree included red pine and northern white cedar.

AGENCY OF NATURAL RESOURCES

DEPARTMENT OF FORESTS, PARKS AND RECREATION

STATE OF VERMONT

FOREST INSECT AND DISEASE CONDITIONS
NORTHERN REGION

CALENDAR YEAR 1989

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INTRODUCTION

The information in this report is based largely on aerial surveys to detect defoliation, dieback, and mortality, as well as ground surveys and observations of forest resource protection personnel and other forestry and department staff.

Aerial surveys were flown in early July to detect pear thrips damage and mid-July to early August to detect gypsy moth defoliation and anthracnose.

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WEATHER SUMMARY

Although 1989 started out with a serious moisture deficit, spring and early summer rains brought groundwater levels back to normal, and tree growth got off to a good start. May was not only wetter than normal, but was warmer than normal, leading to unusually rapid leaf expansion for many tree species. After May it turned dry in much of the northern Champlain Valley area, but the rest of the region averaged above normal for precipitation (Figure 1).

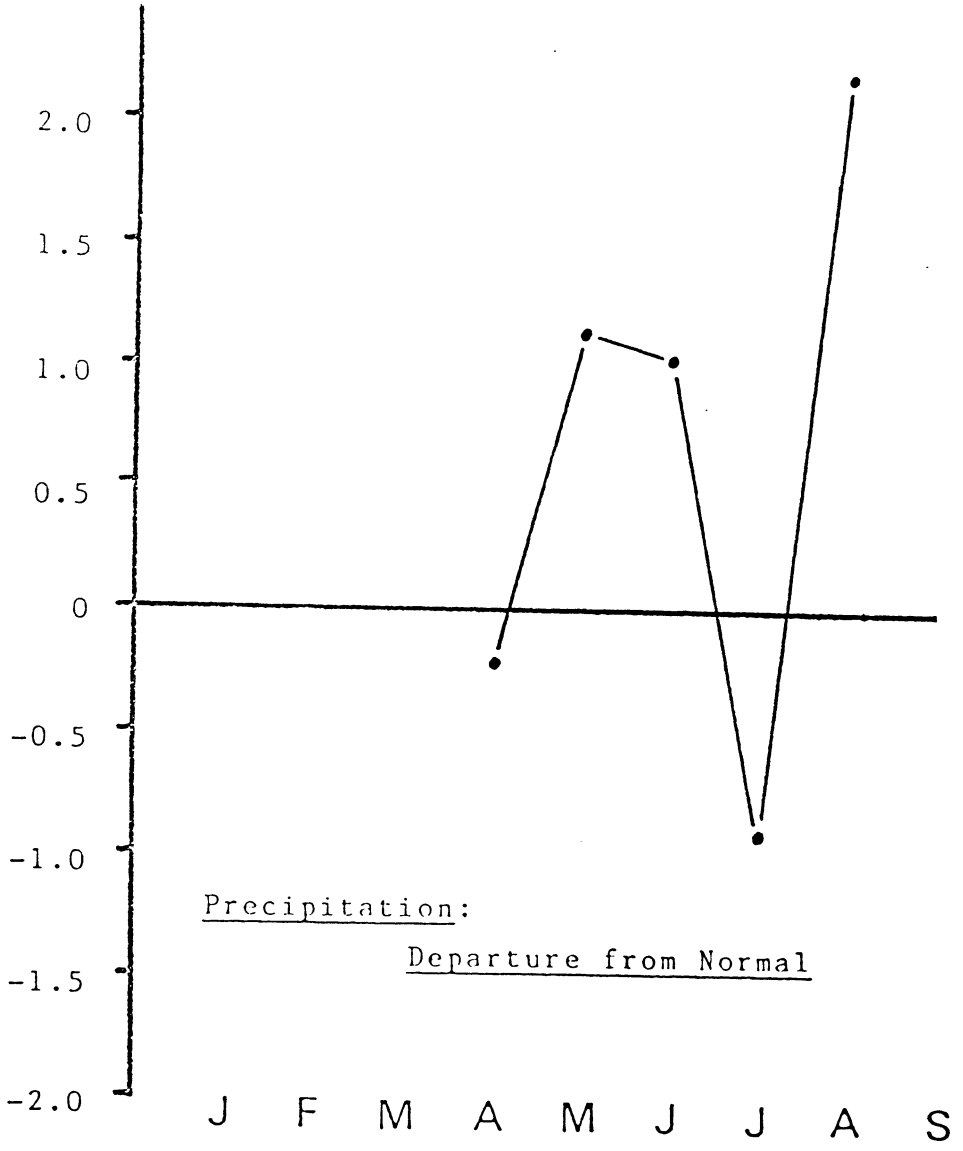
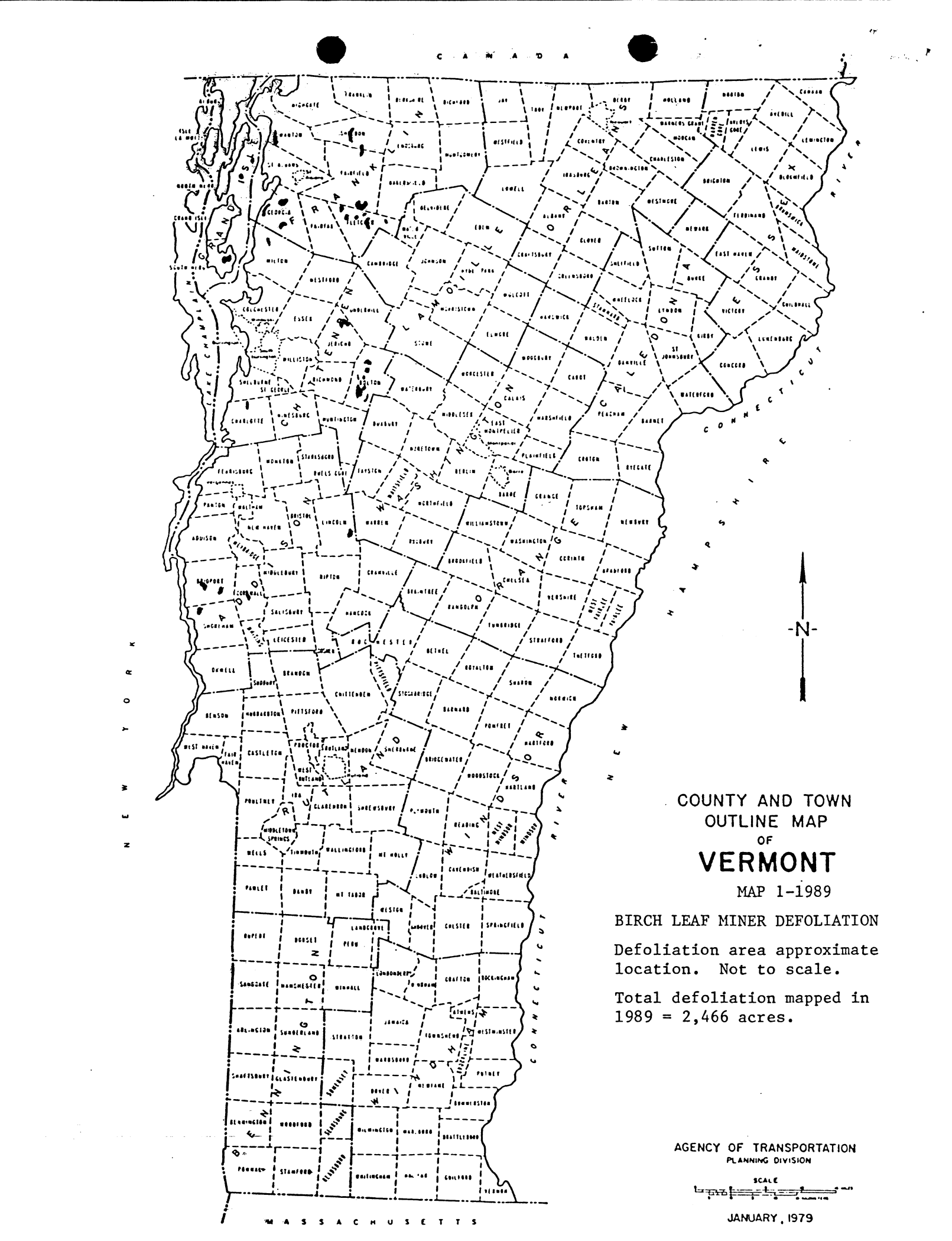


Figure 1. Growing season precipitation departure from normal for Department of Forests, Parks and Recreation weather stations in north-central Vermont (Wolcott, Barre, Randolph, and Fairlee).



COUNTY AND TOWN OUTLINE MAP OF VERMONT

MAP 1-1989

BIRCH LEAF MINER DEFOLIATION

Defoliation area approximate location. Not to scale.

Total defoliation mapped in 1989 = 2,466 acres.

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Birch Leaf Miner, Fenusa pusilla, caused widespread, moderate to heavy defoliation of gray and paper birch again this year with 2,466 acres of defoliation detected in Chittenden, Addison, Franklin, and Grand Isle Counties during the aerial survey (Map 1). Damage was present but not mapped in the other counties. Defoliation this year did not show up until late summer, apparently because the second generation of the insect did the most damage. Heavy rainfall earlier in the season may have contributed to the poor success of the first generation. Occasional twig dieback of paper birch was observed in north-central Vermont, but it was mostly light and scattered.

Forest Tent Caterpillar, Malacosoma disstria, populations continued to be very low this year. Fewer larvae were observed within sugar maple stands than in 1987 and moth catch in pheromone traps remained low (Table 1). The population increase observed in 1988 may have been a temporary one in response to the hot, dry weather.

TABLE 1. Forest Tent Caterpillar Moth Catch in Pheromone Traps, 1988-1989

	Average No. of Moths Per Trap[1]		
	1988		1989
Location	RPC-3 Lure	RPC-2 Lure	RPC-2 Lure
Roxbury	0.0	0.0	0.6
Waterbury	1.0	1.2	3.6
Waterville	2.2	0.2	2.2
Fairfield	0.2	-	0.0
Bethel	1.8	-	0.4
Sherburne	15.0	-	2.6
Average	5.0	0.5	1.6

1. Multi-pher traps baited with RPC-2 component lures in 1989 and 2 and 3 component lures in 1988; 5 traps per lure type for each location.

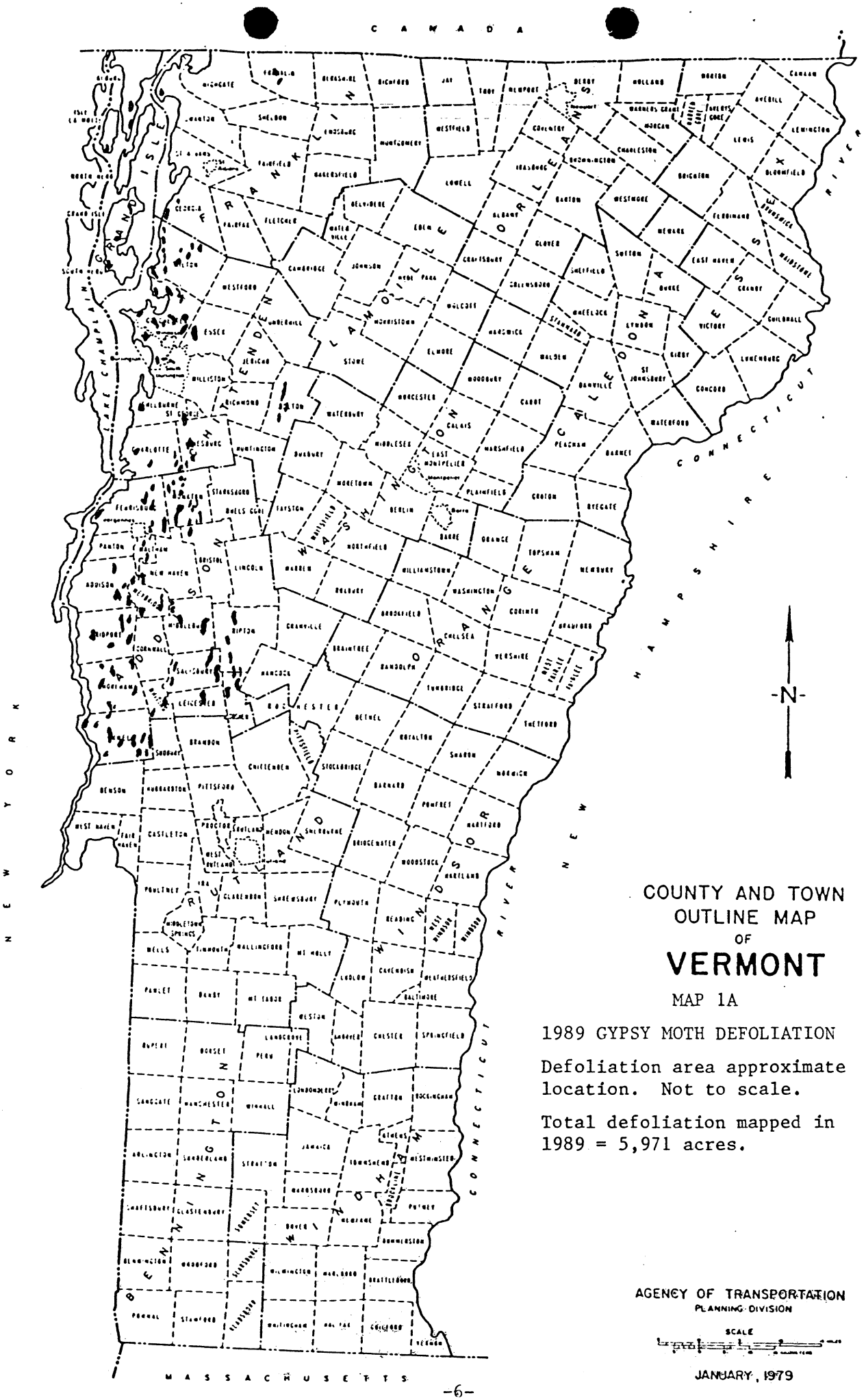
Gypsy Moth, Lymantria dispar, populations increased dramatically this year, with 5,940 acres of heavy defoliation mapped during the aerial survey compared to four acres in 1988 (Table 2, Map 1a).

TABLE 2. 1989 Gypsy Moth Defoliation

County	Acres Heavily Defoliated
Addison	3900
Chittenden	1670
Franklin	100
Grand Isle	289
Orange	12
Total	5971

An increase in egg masses and moths caught in pheromone traps (Tables 3 and 4) were also indicative of a population increase.

Gypsy moth egg mass surveys were conducted during October in the following municipalities in response to concerns over a building gypsy moth outbreak: Burlington, South Burlington, Essex, Colchester, Winooski, Shelburne, Charlotte, Hinesburg, Leicester, and Salisbury. As a result of those surveys, heavy defoliation is predicted for about 8500 forested residential areas, mostly in the greater Burlington area. At the request of the towns, an aerial suppression project is planned to treat these areas with Bacillus thurengienses (B.t.) beginning in late May 1990. This project is expected to receive matching funds from the U. S. Forest Service.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

MAP 1A

1989 GYPSY MOTH DEFOLIATION

Defoliation area approximate location. Not to scale.

Total defoliation mapped in 1989 = 5,971 acres.

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JANUARY, 1979

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TABLE 3. Gypsy Moth Population Counts From Focal Area Monitoring Plots, 1987 - 1989

Plot Location	No. of Moths[1]			No. of Egg Masses[2]		
	1987	1988	1989	1987	1988	1989
Brigham Hill[3]	193	24	61	37	28	74
Arrowhead	127	70	380	21	48	96
Middlesex	66	24	77	0	1	19
Sandbar	-	-	66	45	173	129
Average	129	39	173	26	63	80

1. Total count in one milk carton trap baited with racemic lures.
2. Average number in 15m diameter (.045 acre) burlap-banded plots.
3. Sprayed with B.t. in 1988.

TABLE 4. Gypsy Moth Population Counts From Other Monitoring Plots, 1987 to 1989

Plot Location	No. of Moths[1]			No. of Egg Masses/Acre[2]		
	1987	1988	1989	1987	1988	1989
Colchester-Edgewater	370	23	168	13	13	1200
Colchester-Blakely Rd.	-	-	550	-	2640	4680
Colchester Trailer Pk.	-	88	200	-	44	4880
Essex-Pinewood	-	34	129	-	0	4000
Essex-Church	-	23	99	-	-	3760
Missisquoi H.S.	-	33	68	-	67	-
Average	-	40	202	-	553	3704

1. Total count in one milk carton trap baited with racemic lures.
2. Average number per acre based on a combination of 5 minute walks and 1/40 acre plots.

Maple Leaf Cutter, Paraclemensia acerifoliella, populations noticeably increased throughout most of the region, with light to occasionally moderate defoliation of sugar maple. Most of the damage was confined to lower crowns and understory trees. In some cases, this was combined with pear thrips damage, resulting in substantial overall leaf damage.

Saddled Prominent, Heterocampa guttivata, continued to cause light defoliation in scattered locations, with feeding activity noticeable from the ground but not from the air. This was the second year in a row of this level of activity in Orange, Caledonia and Orleans Counties. The U.S. Forest Service detected 38 acres of light saddled prominent defoliation in Lincoln on the Green Mountain National Forest. An increase in damage from this insect is possible in 1990.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
American Aspen Beetle Gonioctena americana			*N.O.
American Dagger Moth Acronicta americana			N.O.
Birch Leaf Folder Ancylis discigerana	Yellow Birch	Hyde Park Bolton	Light damage observed
Birch Leaf Miner Fenusa pusilla	White Birch Gray Birch Yellow Birch	Throughout	See narrative
Birch Skeletonizer Bucculatrix canadensisella	White Birch Yellow Birch	Orange County Washington County	Occasionally observed
Bruce Spanworm Operophtera bruceata	Sugar Maple	Stowe	Some moths observed during November

*N.O. = not observed

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OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Half Winged Geometer *Phigalia titea*	Red Oak Sugar Maple		N.O.
Japanese Beetle *Popillia japonica*	Ornamentals	St.Johnsbury Lyndonville Champlain Valley	Little defoliation
Lace Bugs *Corythucha*	Elm Balsam Poplar	Washington Orange Counties	Heavy defoliation in several locations
Large Aspen Tortrix *Choristoneura conflictana*			N.O.
Linden Looper *Erranis tiliaria*			N.O.
Locust Leaf Miner *Odontata dorsalis*	Black Locust	St.Johnsbury Richmond	Mostly light defoliation
Maple Leaf Cutter *Paraclemensia acerifoliella*	Sugar Maple	Widespread	Increasing; see narrative
Maple Trumpet Skeletonizer *Epinotia aceriella*	Sugar Maple Red Maple	Widespread	Very common compared to past years but mostly light defoliation
Maple Webworm *Tetralopha asperatella*	Sugar Maple	Widespread	Increasing, particularly in Franklin County; light defoliation
Mountain Ash Sawfly *Pristiphora geniculata*	Mountain Ash		No reports for the first time in many years

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Oak Leafroller *Archips semiferanus*			N.O.
Oak Leaf Tier *Croesia semipurpurana*			N.O.
Oak Skeletonizer *Bucculatrix ainsliella*	Oak		N.O.
Orange-humped Mapleworm *Symmerista leucitys*	Sugar Maple	Danville	
Pear Sawfly *Caliroa cerasi*	Hawthorne	Danville	Heavy defoliation of one tree
Pin Oak Sawfly *Caliroa sp.*			N.O.
Red-humped Oakworm *Symmerista canicosta*	Red Oak		N.O.
Rose Chafer *Macrodactylus subspinosus*	Hardwood Ornamentals	St.Johnsbury Barnet Lyndon	Numerous in scattered locations
Saddled Prominent *Heterocampa guttivata*	Hardwoods		See narrative
Satin Moth *Leucoma salicis*	Silver Poplar Balsam Poplar	Franklin Lamoille Counties	Occasional heavy defoliation of individual trees
Solitary Leaf Roller *Sparganothis pettitana*	Sugar Maple	Franklin County	Commonly observed at very light but increasing population levels

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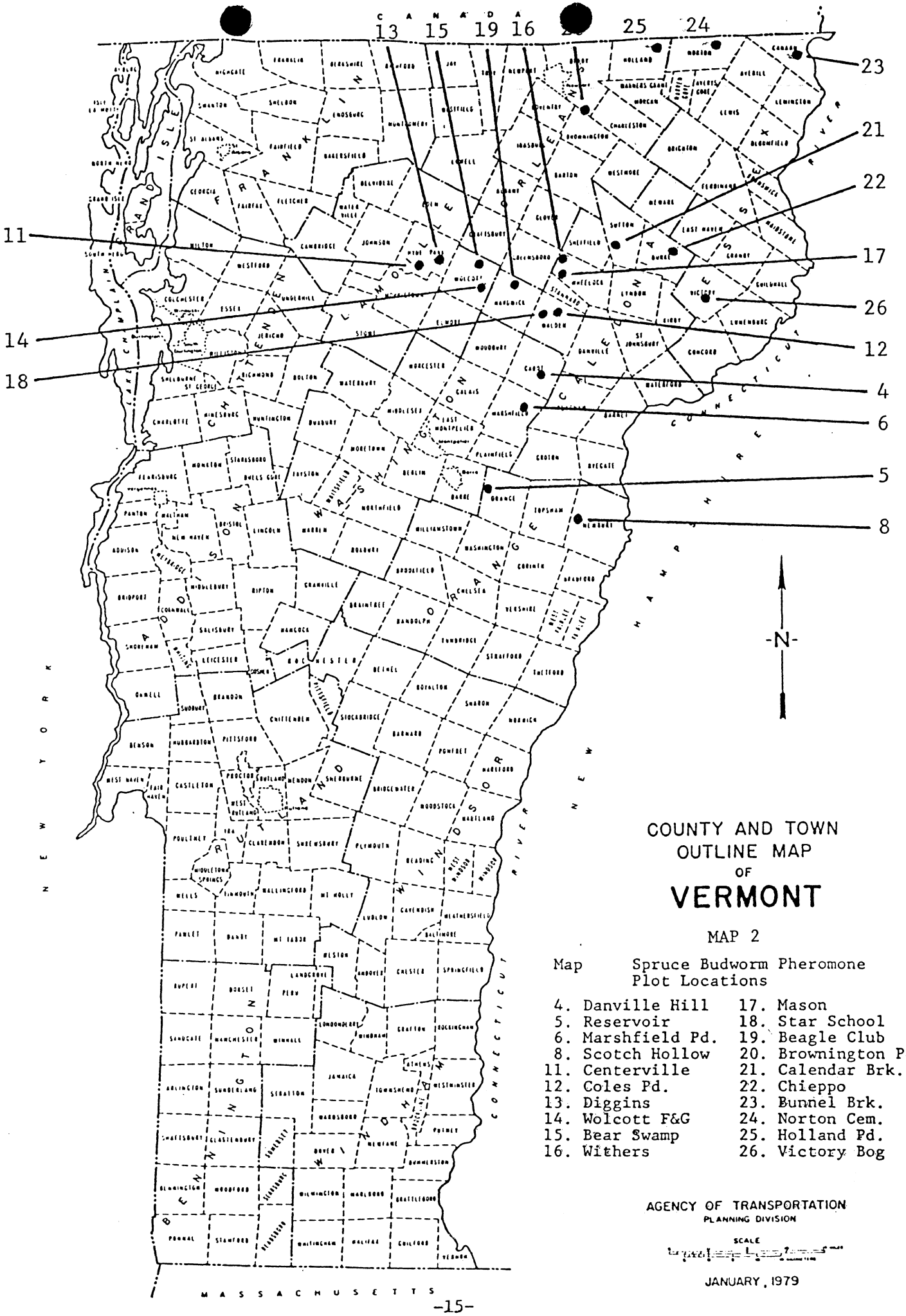
OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Solitary Oak Leaf Miner *Cameraria hamadryadella*			N.O.
Spiny Elm Caterpillar *Nymphalis antiopa*			N.O.
Spring Cankerworm *Paleacrita vernata*			N.O.
Uglynest Caterpillar *Archips cerasivoranus*	Cherry	Widely scattered	Occasionally observed; down from 1988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NEW YORK
CONNECTICUT RIVER
MASSACHUSETTS
COUNTY AND TOWN
OUTLINE MAP
OF
VERMONT
MAP 2
Map Spruce Budworm Pheromone Plot Locations
4. Danville Hill
5. Reservoir
6. Marshfield Pd.
8. Scotch Hollow
11. Centerville
12. Coles Pd.
13. Diggins
14. Wolcott F&G
15. Bear Swamp
16. Withers
17. Mason
18. Star School
19. Beagle Club
20. Brownington Pd
21. Calendar Brk.
22. Chieppo
23. Bunnel Brk.
24. Norton Cem.
25. Holland Pd.
26. Victory Bog
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JANUARY, 1979

VT

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
White Pine Sawfly Neodiprion pinetum			N.O.
Yellow-headed Spruce Sawfly Pikonema alaskensis	Blue Spruce Red Spruce	St.Johnsbury Danville Randolph	Caused moderate defoliation of a 20-year old plantation in Randolph that received heavy defoliation to red spruce in 1988

SAPSUCKING INSECTS, MIDGES AND MITES

Aphids, Periphyllus spp., probably P. americanus and P. testudinacea, were common but at light population levels on developing maple buds early in the season. The mid-summer demorph stages that were commonly seen on sugar maple leaves in 1988 were not detected in 1989. Rainy weather this year may have been a factor in the population collapse.

Balsam Gall Midge, Paradiplosis tumifex, increased significantly in many balsam fir plantations throughout the state this year. Of the northern Vermont plantations annually surveyed for pests, 157 acres were found to be infested with gall midge compared to only 28 acres in 1988. Most of the damage was light, but the sudden appearance of galled needles in many plantations where no damage was evident a year ago, indicates that populations are increasing and likely to be a serious problem next year. The previous two outbreaks of gall midge peaked in 1983 and 1976, seven years apart, so the insect appears to be right on schedule.

Balsam Twig Aphid, Mindarus abietinus, caused widespread curling of balsam fir needles, similar to what was seen in 1988 except for more heavy damage this year. Damage was reported for 272 acres of Christmas trees in northern Vermont, with about 40 percent of the acreage having moderate to heavy damage. Some trees that appeared heavily damaged early in the season outgrew the damage and looked fine by fall. Rains may have reduced later stages of the insect as few overwintering eggs have been found on twigs searched to date. Expect lower populations in 1990.

The use of Acecap systemic implants for trees was tested this spring on seven to 14-foot tall balsam fir trees being attacked by balsam twig aphid and balsam gall midge. Six trees received one to three mini-Acecap 97 implants each, containing 0.25 grams of acephate per cartridge, just when buds were beginning to break. Acecap-treated trees ended up with less than one percent of the branches damaged by twig aphid compared to 16 percent for untreated trees. However, there was no difference in gall midge damage between treated trees and untreated trees.

Oystershell Scale, Lepidosaphes ulmi, populations noticeably decreased but beech dieback associated with infestations of the past three years was much more evident this year. An evaluation of scale population levels within Camel's Hump State Forest showed a drop in number of insects that reflects what was observed throughout the region (Table 6).

TABLE 6. Number of oystershell scales on current year twigs in Camel's Hump State Forest, 1987-1989.[1]

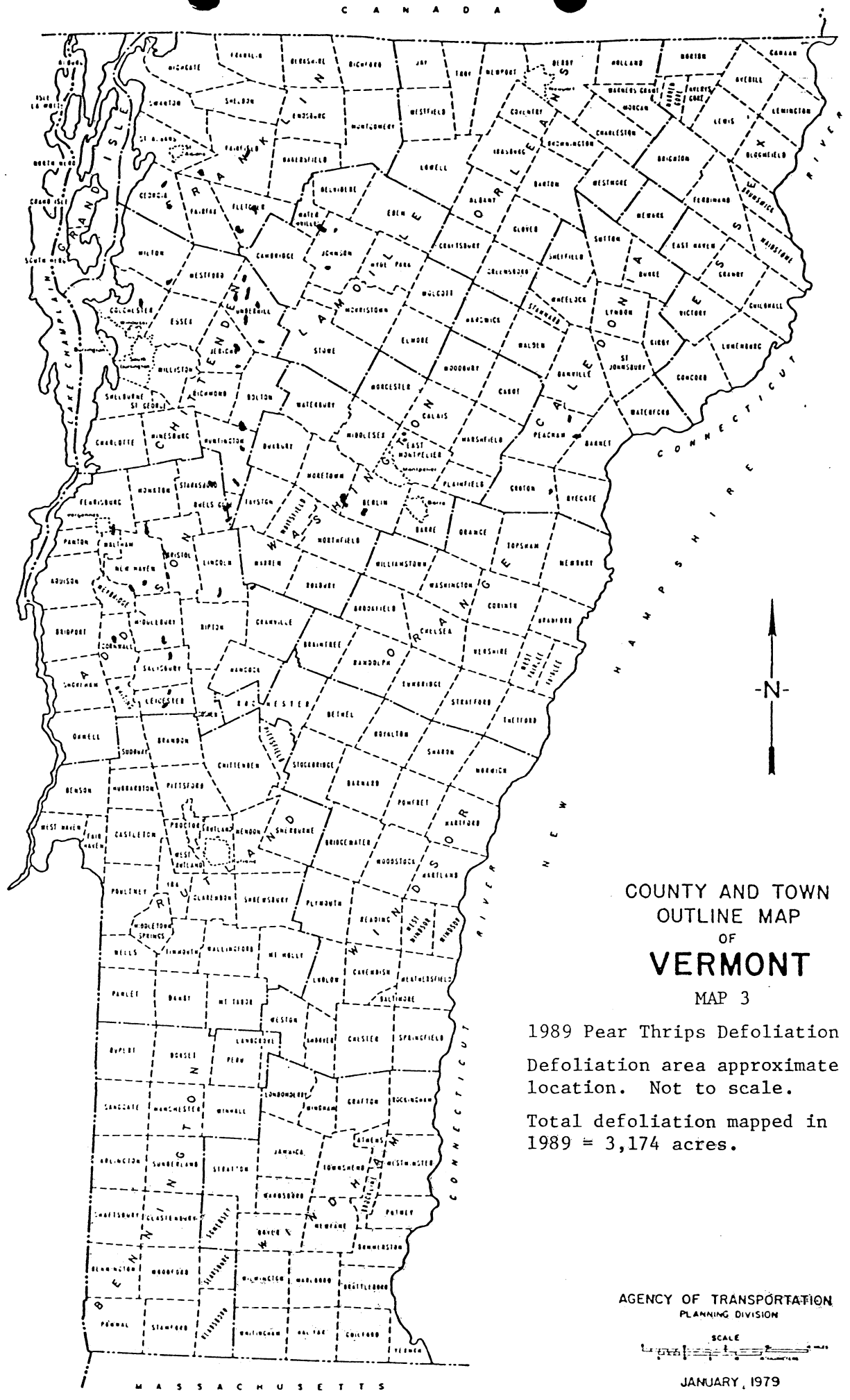
Tree Dominance	Average number of mature viable scales on current year's growth per twig			per millimeter		
	1987	1988	1989	1987	1988	1989
Suppressed	3.7	3.4	1.7	0.10	0.22	0.05
Intermediate	6.8	2.8	1.0	0.07	0.12	0.01
Codominant	9.3	8.8	3.7	0.28	0.64	0.09

1. Average number for 10 branches from one tree per dominance class, collected in September 1987, September 1988, and November, 1989.

Pear Thrips, Taeniothrips inconsequens, damage to sugar maples was less severe and less extensive than in 1988, with only 3,174 acres mapped from the air compared to 469,000 acres in 1988 (Table 7, Map 3). Most of this damage was moderate with the only heavy damage (440 acres) occurring in Lamoille County. Many northern Vermont sugar maple stands received light defoliation, but this could not be detected from the air. A high incidence of anthracnose, other leaf spot diseases, general leaf chlorosis, and maple leaf cutter made it difficult to differentiate damage caused by thrips.

TABLE 7. Acres of forestland damaged by thrips in each county and damage category for 1989. Results from aerial sketch mapping done in late June and early July.

	Acres Damaged in Each Category			
County	Light	Moderate	Heavy	Total
Addison		400		400
Bennington				0
Caledonia	150			150
Chittenden		870		870
Essex				0
Franklin		135		135
Grand Isle				0
Lamoille		244	440	684
Orange				0
Orleans				0
Rutland				0
Washington		935		935
Windham				0
Windsor				0
Total	150	2584	440	3174



COUNTY AND TOWN OUTLINE MAP OF VERMONT

MAP 3

1989 Pear Thrips Defoliation

Defoliation area approximate location. Not to scale.

Total defoliation mapped in 1989 = 3,174 acres.

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Despite a reduction in thrips damage, many areas did have seemingly high population levels of adults and larvae. Thrips larvae became so numerous on sugar maple seedlings in some northern Vermont stands that many seedlings were killed or severely damaged.

Soil sampling was used to estimate population levels before thrips emerged from the soil. The University of Vermont developed a sampling procedure that called for taking 10 soil samples per sugarbush, using a bulb planter, to estimate numbers in the ground. Over 100 sites statewide were sampled in this manner (Map 4). The samples were processed at the University of Vermont Entomology Laboratory where they have developed a procedure for extracting thrips from the soil to facilitate counting. The statewide soil survey showed that populations were generally low in southern Vermont, with the highest levels found in Franklin, Chittenden and Lamoille Counties (Table 8). Soil sampling was repeated in September 1989 to make predictions for 1990.

Pear thrips emergence from the soil was also monitored statewide. Using emergence traps designed at the University Entomology Laboratory, thrips were collected as they emerged from the soil, on a daily basis from 18 sites in the state (Map 4a). From these sites we found that thrips came out of the soil beginning on 18 April, at numerous sites both in southern and northern Vermont, and numbers emerging were generally higher in northern Vermont (Table 9). Another 38 sites in the state were similarly monitored to collect additional data. Traps will be monitored again next spring to begin to establish yearly trends.

Counts of thrips in buds was repeated again this year in southern Vermont (Fig. 2). Counts taken from 100 regeneration bud samples from sites in the four southern counties averaged 1.1 thrips per bud. When compared to last year's average of 8.9 thrips per bud, this reflects the decrease in populations found in southern Vermont. Similar bud counts taken from a northern Vermont sugarbush in Johnson that had the highest soil survey thrips counts in the state (31.6 per bulb planter), averaged 10.6 thrips per bud. Yet this site ended up with only moderate thrips defoliation.

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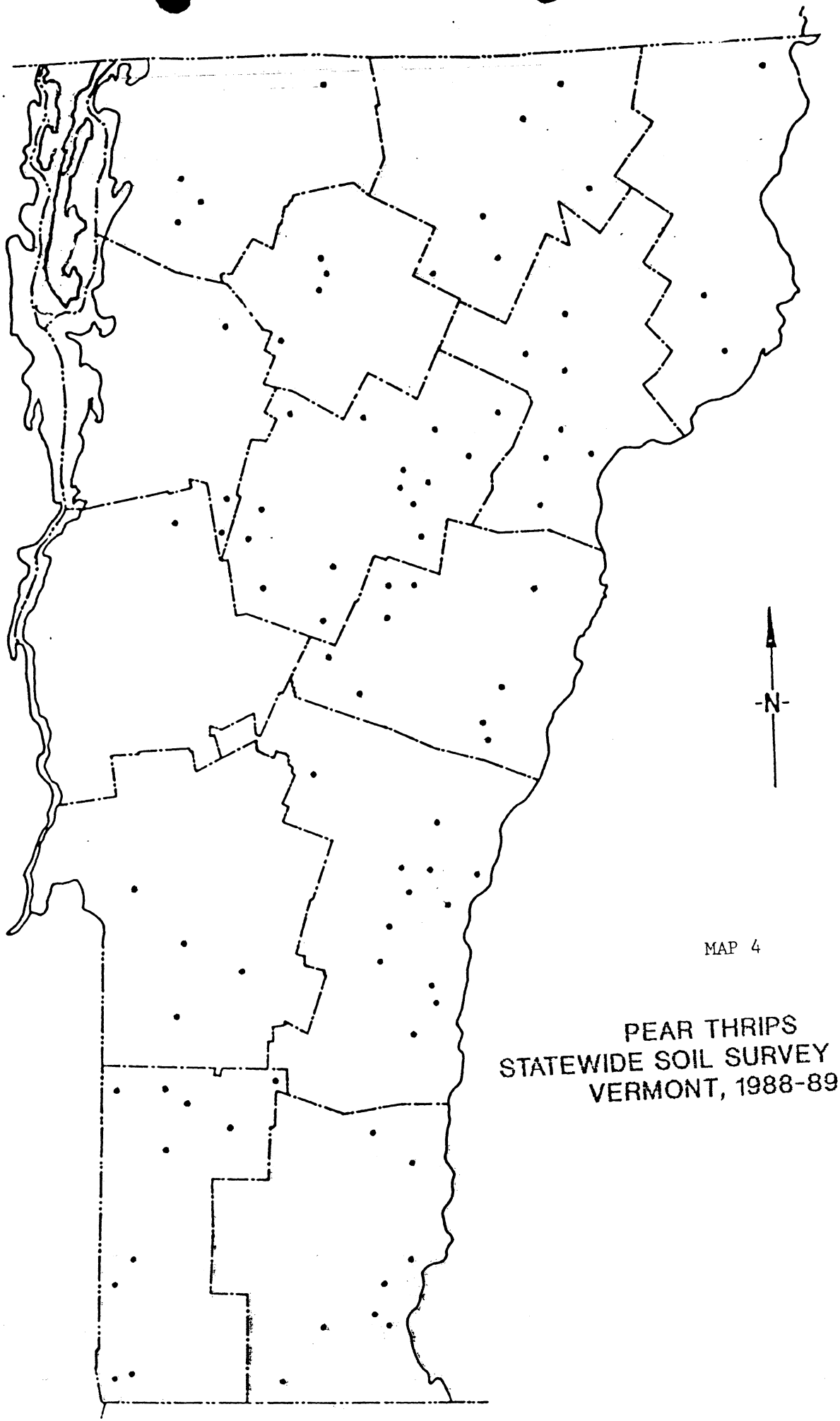
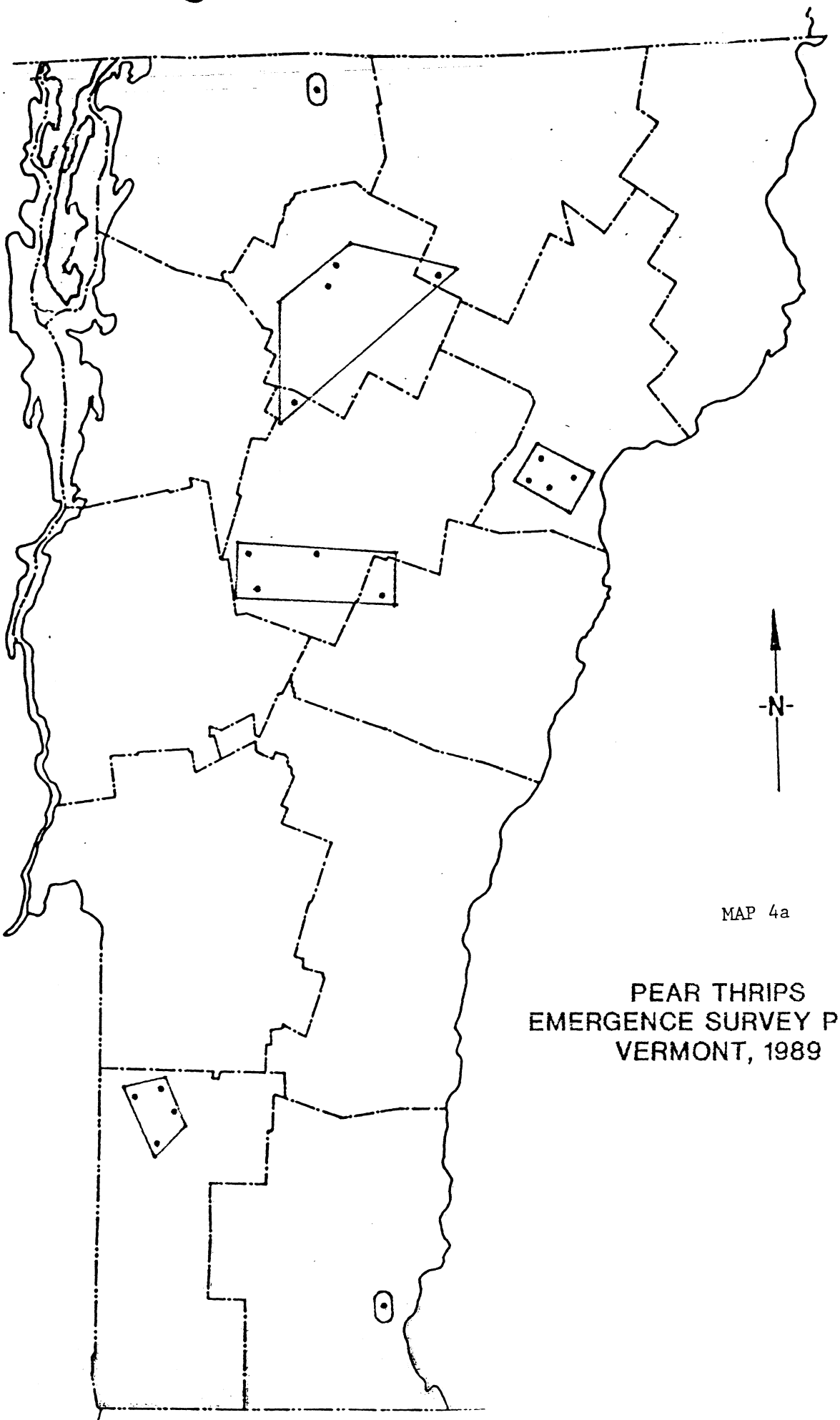


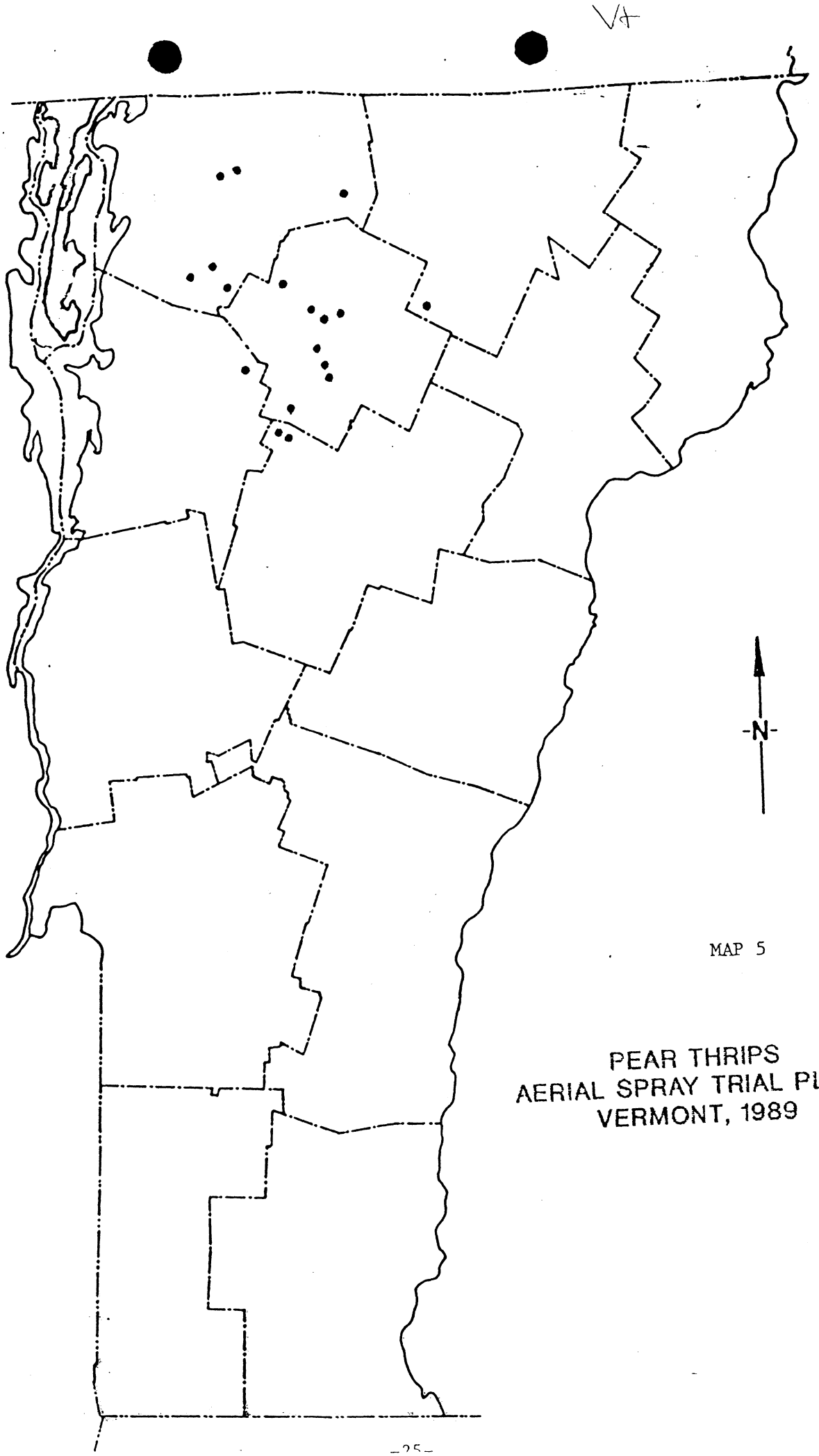
MAP 4

PEAR THRIPS
STATEWIDE SOIL SURVEY PLOTS
VERMONT, 1988-89



MAP 4a

PEAR THRIPS
EMERGENCE SURVEY PLOTS
VERMONT, 1989



MAP 5

PEAR THRIPS
AERIAL SPRAY TRIAL PLOTS
VERMONT, 1989

TABLE 8. Statewide soil survey results for 1988-89 sampling, average of all sites in each county.

County	Thrips Per Bulb Planter
Addison	4.5
Bennington	2.9
Caledonia	2.2
Chittenden	9.4
Franklin/Grand Isle	11.8
Lamoille	14.0
Orange	4.5
Orleans	6.1
Rutland	1.5
Washington	8.9
Windham	4.3
Windsor	2.3

TABLE 9. Thrips emerging from the soil, average number emerging and initial emergence from five regional study sites, 1989.

Location	Number of Thrips Emerging (Range)	Range of Starting Dates for Emergence
Southwest	0.6 to 7.5	20 April to 27 April
Southeast	1.5	18 April
Central	0.2 to 9.5	18 April to 7 May
Northeast	3.3 to 4.1	27 April to 1 May
Northcentral	8.8 to 22.7	18 April

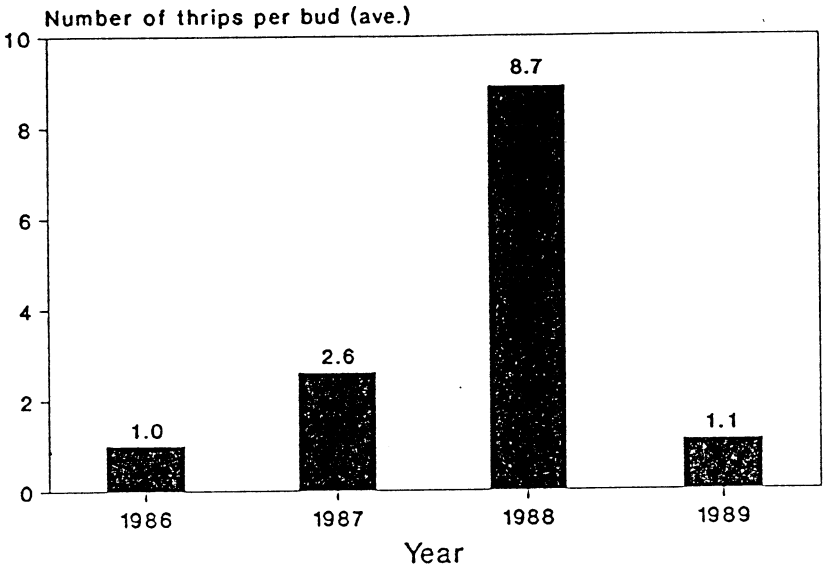


Figure 2. Average thrips counts in buds for 1986 through 1989. Average of 100 buds per site used.

Less severe damage in central and northern Vermont was attributed to two factors. First, budbreak was very fast, allowing thrips little opportunity to feed in buds and cause injury. Second, thrips emergence may have been delayed due to lack of snow cover and frozen soil conditions. This information is based on a field study conducted by the University of Vermont. Their insulated soil plots had thrips emerging from the ground one to two weeks earlier than those plots lacking insulation and snow cover. Thrips emerging later may be too late to attack buds, and would not be as damaging to the leaves. Further studies on cold hardiness and spring emergence are underway.

Because of our past experiences with observing heavier damage following thinnings during an outbreak of a defoliator such as forest tent caterpillar, we are interested in any similar observations for other insects, such as thrips. In one emergence study site in Northfield, a portion of the stand had received a recent heavy thinning. Thrips damage in 1989 was conspicuously moderate to heavy in this area, with only light damage in the remaining uncut portion of the stand.

Several tests were conducted to find an effective control for high thrips populations. Orthene Turf, tree and ornamental spray (75% A.I.) and Margosan-O (Neem seed extract, 0.3% A.I.) were applied to branches and saplings to test their effectiveness in killing pear thrips. The applications were made on 9 May, prior to leaf expansion. Neither material had significantly lower numbers of thrips per bud than unsprayed samples.

The unsprayed samples, however, had relatively low counts, 2.34 thrips per bud. Further testing may provide more definitive results.

In another study, Sevin 4-Oil was applied from a fixed wing aircraft at a rate of one pound per acre to test its effectiveness in controlling thrips and preventing leaf injury, and to test application timings. The material was diluted with equal parts deodorized kerosene, and applied to a total of 10 plots in Franklin, Lamoille and Washington Counties (Map 9). The two timings tested were initial emergence of thrips from the soil and peak emergence (when approximately half the estimated population had emerged). Light damage in unsprayed areas made it difficult to determine how effective the material was. Pre and post-spray bud samples were collected to compare numbers of thrips in buds from sprayed and unsprayed plots. Leaf samples were also collected, ca. three weeks post-spray, to evaluate leaf injury and oviposition scars. Individual trees were rated for thrips damage. Data from sprayed and unsprayed plots will be compared to determine efficacy. Data analysis is being completed at the University of Vermont and results should be available in January 1990.

Bartlett Tree Service conducted spray trials using Orthene, Sevin, and Dormant Oil. Due to very low thrips populations at their test site, no conclusive results were obtained. However, they did find that the Dormant Oil application burned the emerging maple leaves, causing flagging of many branches.

Natural enemy surveys in Vermont found a fungus killing thrips in the soil. In one Vermont site, 73 percent of the thrips collected from the soil had been killed by the fungus named Verticillium lecanii, or the white halo fungus. Results from the statewide soil survey showed this fungus killing thrips in sites throughout the state, with higher incidence in southern Vermont where damage was the heaviest. The white halo fungus is already commercially produced in Europe for use against greenhouse pests, including the glasshouse thrips. Further studies are underway to find out more about the fungus in Vermont, and its promise as a biological insecticide for use in sugar maple forests. Field testing of formulations may be possible for next spring.

A team of researchers headed by the University of Vermont began a two-year survey of natural enemies of pear thrips in Europe. Since the insect originated there and is not a pest problem there, it is thought that natural enemies are keeping populations of pear thrips low. Identification of potential natural enemies could lead to future introductions for control in the U.S. Thus far, three soil fungi have been identified as pear thrips enemies. These researchers plan to focus more on the soil fungi during next year's survey.

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Tours of the pear thrips research site in Randolph were conducted in June for legislators and sugarmakers. In addition, four public meetings were held around the state in September to update sugarmakers, foresters and the general public about ongoing pear thrips work.

Using satellite images to map thrips damage is still being studied by University of New Hampshire researchers. The technique looks promising for damage estimates, but whether the method can be used economically and with enough speed to do field verification is still being evaluated.

Thrips impact on trees has been studied using a root starch sampling technique. Preliminary findings indicated that heavily damaged trees that refoliated (put out a second set of leaves) were able to store adequate starch levels by the end of the growing season. Trees that were moderately damaged by thrips and did not refoliate, tended to have inadequate starch reserves. More studies are needed to confirm these findings and address other impacts to the tree.

State and federal funding was obtained to support pear thrips research in 1989. Continued state support is anticipated, at least through June 1990.

OTHER SAPSUCKING INSECTS, MIDGES AND MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Aphids *Periphyllus spp.*	Sugar Maple	Widespread	See narrative
Aphids *Cinara sp.*	White Pine	Stowe	Heavy on one ornamental
Balsam Gall Midge *Pardiplosis tumifex*	Balsam Fir		See narrative
Balsam Twig Aphid *Mindarus abietinus*	Balsam Fir		See narrative
Balsam Woolly Adelgid *Adelges piceae*	Balsam Fir	Groton	Very light populations
Beech Scale *Cryptococcus fagisuga*	Beech		See Beech Bark Disease

OTHER SAPSUCKING INSECTS, MIDGES AND MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Birch Budgall Mite *Aceria rudis*	Birch		N.O.
Cooley Spruce Gall Adelgid *Adelges cooleyi*	Blue Spruce White Spruce Douglas Fir	Widespread	Reported causing light to moderate damage to 75 acres of Christmas trees in northern Vermont
Cottony Maple Scale *Pulvinaria innumerabilis*	Sugar Maple	Groton	Light infestation
Eastern Spruce Gall Adelgid *Adelges abietis*	Red Spruce White Spruce	Widespread	Damage to Christmas trees increased this year with 36 acres of light to moderate damage of white spruce compared to 6 acres in 1988
Hemlock Woolly Adelgid *Adelges tsugae*	Hemlock	Absent	No suspects seen. Quarantine on hemlock logs and nursery stock from infested areas in effect
Leafhoppers	Sugar Maple Msc. hardwood	Widespread	Moderate feeding on maple and other hardwood leaves in some locations
Lecanium Scale *Lecanium sp.*	Beech	Essex	Down from 1988 levels; difficult to find in 1989
Maple Spindle Gall Mites *Vasates aceris-crumena*	Sugar Maple	Widespread	Remains common
Norway Maple-type Aphid *Periphyllus americanus* and *Periphyllus testudinacea*	Sugar Maple	Widespread	See aphids-*Periphyllus* spp.

VT

OTHER SAPSUCKING INSECTS, MIDGES AND MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Oystershell Scale *Lepidosaphes ulmi*			See narrative
Pear Thrips *Taeniothrips inconsequens*			See narrative
Pine Bark Adelgid *Pineus strobi*	Scots Pine	Widespread	Occasionally observed but populations lighter than in the recent past
Pine Leaf Adelgid *Pineus pinifoliae*	Red Spruce	Wolcott	Gall form observed on red spruce but no observations on shoots of white pine in 1989
Pine Needle Midge *Contarinea baeri*	Scots Pine		N.O.
Pine Needle Scale *Chionapsis pinifoliae*	White Pine	Waterford	One ornamental infested
Pine Spittlebug *Aphrophora parallela*	Conifers	Widespread	Light damage similar to 1988 detected on 87 acres of Scots and white pine Christmas trees
Pine Thrips *Gnophothrips sp.*	Scots Pine		N.O.
Pine Tortoise Scale *Toumeyella parvicornis*	Scots Pine		N.O.
Root Aphid *Prociphilus americanus*	Balsam Fir Fraser Fir	Widely scattered	Populations down; only one of 25 plantations checked by VT Dept. Agriculture in '89 had aphids compared to four plantations in '88

OTHER SAPSUCKING INSECTS, MIDGES AND MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Spruce Bud Scale *Physokermes piceae*			N.O.
Spruce Spider Mite *Oligonychus ununguis*	Balsam Fir White Spruce Fraser Fir	Caledonia County Barre	Numerous reports, both ornamentals and Christmas trees; Populations appeared to build late in the summer. Could be a problem in 1990, particularly if the early part of the growing season is dry
Thrips Unknown species	White Fir	Pownal	Moderate damage to scattered individual trees
Treehoppers Membracidae	Red Oak		N.O.
Woolly Alder Aphid *Prociphilus tessellatus*	Silver Maple Alder	Newark Peacham	Heavy on alders
Woolly Apple Aphid *Eriosoma lanigerum*	American Elm		N.O.

BUD, SHOOT AND STEM INSECTS

Balsam Shootboring Sawfly, Pleroneura brunneicornis, appears to be following the past trend of heavy populations only in even years. This year light to moderate damage was detected in 48 acres of balsam and Fraser fir Christmas trees in northern Vermont compared to 39 acres of heavy damage and 42 acres of light damage in 1988. Growers should anticipate heavier damage from this insect in 1990.

OTHER BUD, SHOOT AND STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Allegheny Mound Ant Formica exsectoides			N.O.
Ambrosia Beetle Scolytidae	White Birch	Caledonia County	Causing sawlog quality loss on state land timber sale
Balsam Shootboring Sawfly Pleroneura brunneicornis	Balsam Fir Fraser Fir		See narrative
Butternut Curculio Conotrachelus juglandis			N.O.
Coneworm Dioryctria spp.	Fraser Fir White Spruce Blue Spruce	Addison Elmore Barre	Shoot damage observed in some locations
Locust Borer Megacyllene robiniae			N.O.
Maple Petiole Borer Caulocampus acericaulis	Sugar Maple	Hardwick	
Northern Pine Weevil Pissodes approximatus	Red Pine	Morrisville	Attacking large trees dug for nursery stock
Pales Weevil Hylobius pales	Scots Pine	Widespread	Damage increased this year; light to moderate damage reported for 170 acres of Scots pine Christmas trees compared to 25 acres in 1988

OTHER BUD, SHOOT AND STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Pine Gall Weevil *Podapion gallicola*			N.O.
Pine Root Collar Weevil *Hylobius radicis*	Scots Pine	Walden	
Pitted Ambrosia Beetle *Corthylus punctatissimus*	Sugar Maple Seedlings	Widely scattered	More oommon than in the past, especially where sugar maple seedlings are numerous
Pseudanthonomus validus	Yellow Birch	Scattered	Noticeable in 1988 but not observed this year
Round-headed Apple Tree Borer *Saperda candida*			N.O.
Twig Pruner *Elaphidionoides villosus*			N.O.
White Pine Weevil *Pissodes strobi*	White Pine Scots Pine Blue Spruce Norway Spruce White Spruce Red Spruce		Remains common. Light to moderate damage detected on 215 acres of white and Scots pine Christmas trees compared to 70 acres in 1988
White Spotted Sawyer *Monochamus scutellatus*	Balsam Fir	Bakersfield Brookfield E. Burke	Light-moderate damage (branch flagging) to Christmas trees

BARK BEETLES

INSECT	HOST(S)	LOCALITY	REMARKS
Bronze Birch Borer *Agrilus anxius*	White Birch		N.O.
Eastern Larch Beetle *Dendroctonus simplex*	American Larch	Widespread but especially Caledonia County	Some dying trees associated with attack by this beetle but only 46 acres of new decline detected by aerial survey this year compared to 646 acres in 1988
Elm Bark Beetles *Hylurgopinus rufipes* *Scolytus multistriatus*	American Elm	Widespread	See Dutch Elm Disease
Hemlock Borer *Melanophila fulvoguttata*			N.O.
Pine Engraver *Ips pini*	Red Pine		N.O.
Red Turpentine Beetle *Dendroctonus valens*			N.O.

VT

FOREST DISEASES

Scleroderris Canker caused by Ascocalyx abietina, was not found in any new locations this year for the third consecutive year. A total of 56 Christmas tree plantations within the quarantine zone (Map 6) and 105 red and Scots pine plantations in 27 towns bordering the quarantine area were surveyed for the presence of the disease, all with negative results. The disease does not appear to be spreading outside of previously infected plantations, and within infected plantations the rate of spread has slowed.

The total number of plantations in the state known to be infected remains at 124, consisting of 106 red pine and 18 Scots pine plantations. This represents 842 and 150 acres respectively, for a total of 992 acres infected. Another six plantations were infected at one time, but have since had the disease eradicated or the trees cut. Some recent infection can be found within most of the quarantine zone.

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Annual Canker *Fusarium sp.*	Sugar Maple		N.O.
Balsam Fir Twig Abnormality *Sclerotinia kerneri*	Balsam Fir		N.O.
Beech Bark Disease *Cryptococcus fagisuga* and *Nectria coccinea* var. *faginata*	American Beech	Widespread	Increasing scale and Nectria in many northern Vermont stands. Some trees severely infested with scale (white-washed) observed in East Montpelier
Black Knot *Dibotryon morbosum*	Cherry	Widespread	Abundant
Butternut Canker *Sirococcus clavigignenta-juglandacearum*	Butternut	Orleans County	Frequently observed wherever there is butternut
Caliciopsis Canker *Caliciopsis pinea*	White Pine	Widely scattered	Occasionally observed; remains particularly noticeable in Orange County

VI

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Chestnut Blight *Cryphonectria parasitica*	Chestnut	Monkton	On roadside trees
Cytospora Canker *Leucostoma kunzei*	Blue Spruce	Widespread	Common on ornamentals
Diplodia Shoot Blight *Diplodia pinea* (*Sphaeropsis pinea*)	Red Pine	Widely scattered	No new infections observed
Dutch Elm Disease *Ceratocystis ulmi*	American Elm	Widespread	Remains common but not quite as heavy as in 1988
Eastern Dwarf Mistletoe *Arceuthobium pusillum*	Red Spruce		No new locations discovered
Fir Broom Rust *Melampsorella caryophyllacearum*	Balsam Fir	Widely scattered	Occasionally observed
Fireblight *Erwinia amylovora*	Apple	Caledonia Essex Counties	Numerous calls, causing some tree mortality
Hypoxylon Canker *Hypoxylon pruinatum*	Quaking Aspen		Remains common in aspen stands
Maple Canker *Steganosporium sp.* *Nectria sp.*		Widespread	Associated with continued dieback related to 1988 drought but less common
Oak Wilt *Ceratocystis fagacearum*	Oaks	Absent	No suspects seen by trained observers during aerial flights
Sapstreak *Ceratocystis coerulescens*	Sugar Maple	Vershire Braintree	Sapstreak stain patterns observed on firewood removed from sugar bushes

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Scleroderris Canker *Asocalyx abietina*			See narrative
Sirococcus Shoot Blight *Sirococcus strobilinus*	Red Pine		No new infections found
Steganosporium spp.	Sugar Maple	Widespread	This opportunistic branch fungus continued to be associated with branch dieback probably related to the 1988 drought; much less common this year than in 1988 however
Verticillium Wilt *Verticillium albo-atrum* or *V. dahliae*	Sugar Maple		N.O.
White Pine Blister Rust *Cronartium ribicola*	White Pine	Widespread	Continues to cause some mortality of Christmas trees and ornamentals; damage reported for 111 acres of Christmas trees in northern Vermont, of which 4 acres were heavy and 31 acres were moderate
Woodgate Gall Rust *Endocronartium harknessii*	Scots Pine	Widespread	Remains common on susceptible Scots pine Christmas trees; damage similar to 1988

VT

FOLIAGE DISEASES

Anthracnose, caused by Gloeosporium spp., damaged 69,890 acres of sugar maple in Orleans, Caledonia and Essex Counties (Table 10, Map 7). It was particularly noticeable at higher elevations. Elsewhere in the region it was common, but more scattered and tended to be mixed with pear thrips damage, leaf scorch, leaf spots, and a general leaf chlorosis so could not be separated out during aerial survey. In north-central Vermont, anthracnose was often associated with stands weakened by drought in 1988. Heavy damage to roadside white ash trees was common in the Middlebury area.

TABLE 10. Acres of heavy damage by anthracnose mapped during July and August aerial surveys.

County	Acres
Caledonia	21,143
Essex	25,359
Orleans	23,388
Total	69,890

Fir-Fern Rust, caused by Uredinopsis mirabilis, increased this year, probably because of a dramatic increase in the number of rainy days during needle elongation compared to 1988. Lightly infected balsam fir Christmas trees were detected in 52 acres this year compared to 11 acres in 1989. Damage was more widespread than these figures suggest because light damage is noticeable for only a short amount of time from late June to early July. There is likely to be a lot of infection overwintering on the alternate sensitive fern hosts, so, if next spring is wet, damage is likely to increase in 1990.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Anthracnose Gloeosporium spp.	Sugar Maple		See narrative
Cedar-Apple Rust Gymnosporangium juniperi-virginianae			N.O.
Cyclaneusma Needlecast (formerly Naemacyclus) Cyclaneusma minus	Scots Pine	Widespread	Similar in distribution to Lophodermium needlecast but causing heavier damage because it can infect needles of all ages at any time during the growing season
European Larch Needlecast Mycosphaerella laricina	European Larch		N.O.
Fir-Fern Rust Uredinopsis mirabilis	Balsam Fir	Widespread in northern Vermont	See narrative
Lophodermium Needlecast Lophodermium seditiosum	Scots Pine	Widespread in scattered locations	Causing mostly light damage to Christmas trees similar to 1988
Phyllosticta Leafspot Phyllosticta spp.	Sugar Maple	Widely scattered but in north-central and northeastern Vermont	Suspected cause of tiny leaf spots that were extremely numerous and common in some stands

VT

Larch Decline associated with outbreaks of the eastern larch beetle continues in some areas, but is mostly limited to scattered individual trees. See eastern larch beetle for acres affected.

Maple Chlorosis was aerially detected on 103,338 acres in north-central and northeastern Vermont from about mid-summer on (Table 11, Map 8). Earlier in the summer, these stands had appeared healthy and green, perhaps partially due to sufficient spring rainfall. But by mid-summer, leaves of many hardwood trees, especially sugar maple, turned very chlorotic. Some of these leaves dropped prematurely. Contributing to the off-color appearance were numerous foliage diseases, including anthracnose, tar spot of maple, and various leaf spots; leaf scorch on some trees; top dieback and small leaves on yellow birch; and a heavy seed crop on red maple in many northeastern locations. Other contributing factors included defoliation by birch leaf miner and birch skeletonizer on birch, and pear thrips and maple leaf cutter on sugar maple. Areas defoliated in the past by forest tent caterpillar and frost were especially noticeable.

Where no biotic agent was present, the chlorosis may be due to the 1988 drought. Many of the trees that exhibited chlorosis, leaf drop and top dieback were on shallow to ledgy well-drained soils. Areas where anthracnose was heavy enough to be the dominant factor were mapped as such.

Red Spruce Decline continues throughout the state, particularly on high elevation and dry sites. In Essex County, 529 acres of high elevation spruce decline and mortality were detected during the aerial survey.

Sugar Maple Dieback remains common. Much of the recent dieback that was thought to have been initiated by the drought of 1988 continued this year, although it was much reduced compared to last year. Steganosporium, an opportunistic fungus capable of killing weakened branches, was again frequently associated with the dieback.

White Pine Needle Blight was not detected this year for the second consecutive year.

ROOT DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Annosus Root Rot *Heterobasidion annosum*	Red Pine		No new reports this year
Shoestring Root Rot *Armillaria spp.*	Many	Widespread	Continues to be common on declining trees; no increase in severity observed

DIEBACKS, DECLINES AND ENVIRONMENTAL DISEASES

Ash Dieback and mortality remains common in the Champlain Valley, especially where the basal area of ash is substantial (i.e.., 30% or higher). The presence of witches brooms in many of these stands indicates that ash yellows disease is probably an important factor in the disease here. Elsewhere in the region, ash dieback is less noticeable and no witches brooms have been reported.

Birch Decline and mortality continues to be noticeable in scattered locations throughout the region, particularly at upper elevations. In some areas this decline may be associated with repeated defoliation by birch leaf miner. The effect of frost heaving and the failure of frozen roots to absorb moisture during recent cold, open winters may also be a factor for this shallow-rooted species. An apparent acceleration in dieback was observed for many ridge-top yellow birches late this summer, following the second open winter in the past eight years.

Dieback and Mortality of ornamental plantings, particularly on dry or exposed sites, and particularly for balsam fir, occurred in scattered locations, from the Champlain Valley to Lamoille County. Young balsam fir trees, usually less than 10 feet tall, typically died back to within a few inches of the ground early this summer. Other species affected to a lesser degree included red pine and northern white cedar. No biotic causal agents could be identified. This dieback is thought to be related to the 1988 drought, coupled with the open winter of 1988-89.

VT

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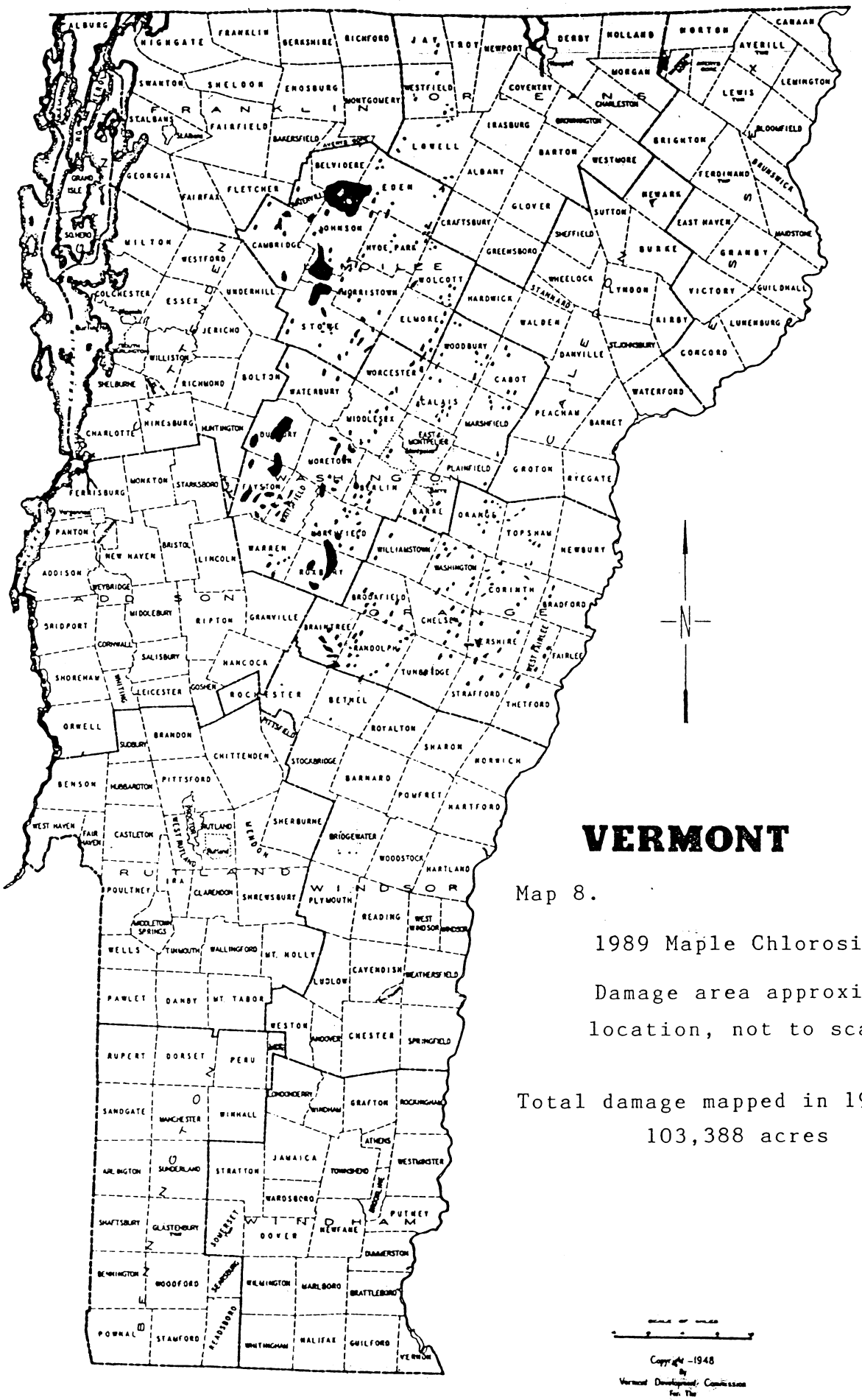
VT



VERMONT

Map 8.

1989 Maple Chlorosis

Damage area approximate location, not to scale

Total damage mapped in 1989, 103,388 acres

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TABLE 11. 1989 areas of maple chlorosis detected during aerial survey.

County	Acres
Lamoille	44,139
Orange	14,568
Orleans	3,055
Washington	41,626
Total	103,388

ANIMAL DAMAGE

ANIMAL	SPECIES DAMAGED	LOCALITY	REMARKS
Beaver	Many	Widespread	Increase in complaints from waterfront property owners. Low fur prices have led to a dramatic increase in beaver populations
Deer			No damage observed
Moose	Mountain Ash	Lemington	Killed numerous 6-8 inch dbh trees at upper elevations
Mouse	Apples Young maples	Caledonia County	Increase in reports of damage from overwintering mice
Porcupine	Many	Scattered	Slight increase in damage and complaints
Sapsucker	White Birch Sugar Maple Hemlock	Widely scattered	Remains common
Squirrel	Maple tubing		Complaints down from 1988